$ZnSe_2O_5$ NANOCRYSTALS SYNTHESIS IN A NANOPOROUS LAYER OF SILICON DIOXIDE ON SILICON

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In this work, we present the study of structural and physical properties of $ZnSe_2O_5$ nanocrystals what obtained by electrochemical deposition in microchannels of a-SiO_2/Si-n track template.

The tracks in a-SiO_2/Si-n substrate were obtained by irradiation with Xe 200 MeV ions and fluence of 10^8 ions/cm^2 with subsequent chemical etching in 4% aqueous HF solution. The etchant included m(Pd) = 0.025 g, etching time 10 minutes, etching temperature T=18˚±1°C. Analysis of the surface before and after electro-chemical deposition (ECD) was carried out on a JSM-7500F scanning electron microscope. For ECD, the following electrolyte composition was used: Zn - 7.2 g/l, SeO_2 - 0.2 g/l. Also, the standard electrolytic cell was used, with zinc electrodes; the voltage across the electrodes was 1.25 V and deposition time was 15 minutes. Figure 1 shows the SEM images of the surface after the ECD.

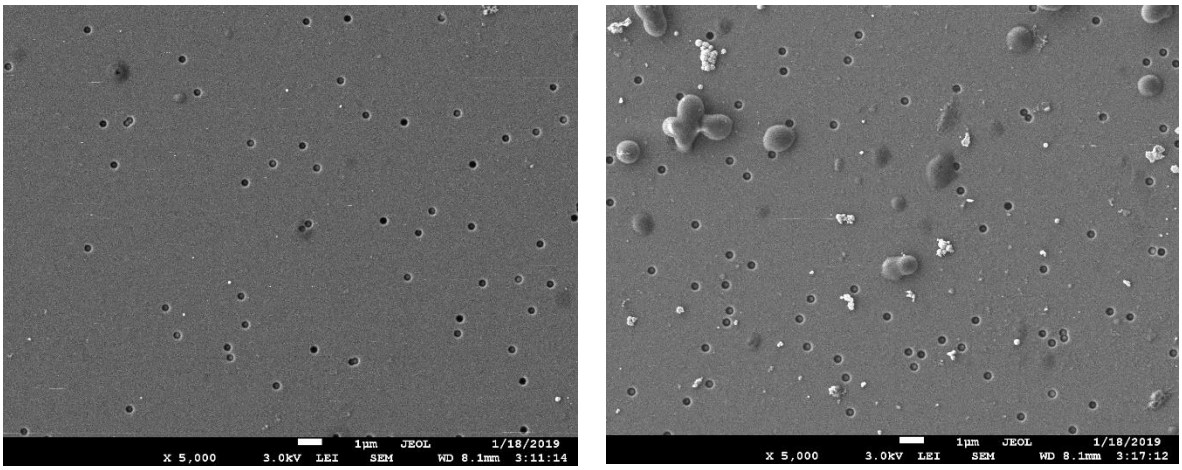

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Fig. 1. SEM images of the surface a) 4-th sample; b) 6-th sample after 15 minutes ECD at U = 1.25 V

X-ray diffraction analysis (XRD) of six samples was performed on a D8 ADVANCE ECO X-ray diffractometer. As result, we shown that $ZnSe_2O_5$ nanocrystals is created after ECD and they have an orthorhombic crystal structure, the space group — Pbcn (60). Our observed unit cell parameters: a = 6.80307 Å; b = 10.35266 Å; c = 6.14842 Å, which gave good agreement in comparison with experimental data [1].

The main phase for all samples is crystalline, it dominates over amorphous and the degree of crystallinity varies within 60-76%.

It worth noting, as we know $ZnSe_2O_5$ nanocrystals obtained first time by electrochemical deposition into nanopores of a-SiO_2/Si-n.

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СИНТЕЗ НАНОПОРОШКОВ $Y_2(OH)_5NO_3 \cdot nH_2O$ И ПРОЗРАЧНОЙ КЕРАМИКИ Y_2O_3

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SYNTHESIS OF NANOPOWDERS AND TRANSPARENT Y_2O_3 CERAMICS FROM $Y_2(OH)_5NO_3 \cdot NH_2O$ PRECURSORS

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The work is devoted to the synthesis of nanopowders and nearly transparent ceramics Y_2O_3 from yttrium hydroxynitrate ($Y_2(OH)_5NO_3 \cdot nH_2O$) precursors precipitated at constant pH from 7 to 10. It is known that the pH value during controlled mixing of solutions $Y(NO_3)_3$ and NH_4OH has a significant effect on the structure of precipitated precursors. The influence of the structure of calcined nanopowders Y_2O_3 on the properties of transparent uniaxial pressed and sintered ceramics were investigated.

Прозрачная керамика на основе Y_2O_3 находит широкое применение в лазерной технике при изготовлении твердотельных лазеров высокой мощности. Обладая светопропусканием в широком диапазоне частот (0,2 − 8 мкм), Y_2O_3 характеризуется повышенной термостабильностью, теплопроводностью и отсутствием фазовых переходов по сравнению с широко используемой керамикой YAG [1]. Создание прозрачных образцов монокристаллов Y_2O_3 является сложной задачей за счет тугоплавких свойств материала, поэтому прибегают к методам получения мелкокристаллической керамики посредством прессования и спекания оксидных порошков с заданными свойствами. Настоящая работа посвящена исследованию влияния условий синтеза осадков $Y_2(OH)_5NO_3 \cdot nH_2O$ и прокаленных порошков на свойства прозрачной керамики Y_2O_3.